CLAIMS:

1. A multi-wavelength laser source comprising:
   a) an input for receiving an energy signal;
   b) a gain section in communication with said input, said gain section including a gain medium having a superstructure grating forming a distributed Fabry-Perot-like structure, in use the gain section generates a multi-wavelength laser signal when the energy signal is applied to the gain section;
   c) an output for emitting the multi-wavelength laser signal.

2. A multi-wavelength laser source as defined in claim 1, wherein the energy signal is generated by either one of a pump laser diode, a fiber laser pump, a solid state laser pump and a raman laser pumps.

3. A multi-wavelength laser source as defined in claim 1, wherein the gain section further comprises an amplifying section.

4. A multi-wavelength laser source as defined in claim 1, wherein the superstructure grating is a continuous grating such as to provide a multi-wavelength laser having substantially equally spaced frequencies.

5. A multi-wavelength laser source as defined in claim 1, wherein the superstructure grating is a discontinuous grating.

6. A multi-wavelength laser source as defined in claim 1, wherein the superstructure grating comprises:
   a) a first grating segment;
   b) a second grating segment superposed at least in part on said first grating segment.

7. A multi-wavelength laser source as defined in claim 6, wherein the first grating segment is a chirped Bragg grating.

8. A multi-wavelength laser source as defined in claim 7, wherein the second grating segment is a chirped Bragg grating.

9. A multi-wavelength laser source as defined in claim 6, wherein the first grating segment and the second grating segment are substantially similar to one another.

10. A multi-wavelength laser source as defined in claim 1, wherein the superstructure grating comprises a plurality of grating segments, each grating segment in said plurality of grating segments overlapping at least in part at least another grating segment in said plurality of grating segments.

11. A multi-wavelength laser source as defined in claim 1, wherein the superstructure grating comprises a plurality of sequential grating segments, each grating segment being associated to a respective period and phase.

12. A multi-wavelength laser source as defined in claim 1, wherein the superstructure grating includes an index grating structure.

13. A multi-wavelength laser source as defined in claim 1, wherein the superstructure grating has a complex apodization shape in amplitude.

14. A multi-wavelength laser source as defined in claim 13, wherein the superstructure grating has a complex apodization shape in phase.

15. A multi-wavelength laser source as defined in claim 1, wherein the gain medium is selected from the set consisting of erbium-doped glass, rare earth doped glasses, crystals, semiconductor materials and doped polymer materials.

16. A multi-wavelength laser source as defined in claim 1, wherein the gain medium is a homogenously broadened gain medium.

17. A multi-wavelength laser source as defined in claim 16, wherein said gain section includes an optical waveguide.

18. A multi-wavelength laser source as defined in claim 17, wherein the optical waveguide includes either one of an optical fiber, a channel waveguide, a planar optical waveguide, a photonic bandgap waveguide and a hollow waveguide.

19. A multi-wavelength laser source as defined in claim 17, wherein said optical waveguide includes a waveguide core and a waveguide cladding.

20. A multi-wavelength laser source as defined in claim 19, wherein the superstructure grating is located in the waveguide core.

21. A multi-wavelength laser source as defined in claim 19, wherein the superstructure grating is located in the waveguide cladding.

22. A method suitable for generating a multi-wavelength laser signal, said method comprising:

a) receiving an energy signal;

b) providing a gain section including a gain medium having an superstructure grating forming a distributed Fabry-Perot-like structure;

c) providing the energy signal to said gain section to generate a multi-wavelength laser signal.

23. A method for manufacturing a multi-wavelength laser source, said method comprising:

a) providing a gain section;

b) applying a superstructure grating to at least a portion of said gain section, the superstructure grating forming a distributed Fabry-Perot-like structure;

c) positioning said gain section in communication with a pump laser unit, the pump laser unit being adapted for generating an energy signal adapted for causing said gain section to generate a multi-wavelength laser signal.

24. A method as defined in claim 23, wherein applying a superstructure grating to at least a portion of said gain section comprises exposing at least a portion of said gain section to UV radiation in order to induce the superstructure grating.

25. A method as defined in claim 23, wherein applying a grating to at least a portion of said gain section comprises using lithographic techniques to induce the superstructure grating.

26. A method as defined in claim 23, wherein applying a superstructure grating to at least a portion of said gain section comprises:

a) applying a first grating to a first segment of said gain section;

b) applying a second grating to a second segment of said gain section, said first segment and said second segment overlapping at least in part with one another.

27. A method as defined in claim 26, wherein the first grating and the second grating are substantially similar to one another.

28. An optical transmitter apparatus comprising the multi-wavelength laser source described in claim 1.

29. A device suitable for providing optical components characterization comprising the multi-wavelength laser source described in claim 1.

30. A device suitable for providing temporal spectroscopy functionality comprising the multi-wavelength laser source described in claim 1.

31. A device suitable for providing material characterization for non-linear effects comprising the multi-wavelength laser source described in claim 1.

32. A multi-wavelength laser source comprising:

a) a pump laser unit adapted for generating an energy signal;

b) a gain section including a gain medium having an superstructure grating forming a distributed Fabry-Perot-like structure, the pump laser unit being adapted for applying the energy signal to said gain section such as to cause a multi-wavelength laser signal to be generated;

c) an output for emitting the multi-wavelength laser signal.

33. A multi-wavelength laser source as defined in claim 32, wherein the pump laser unit is positioned such as to generate the energy signal in a co-propagation relationship with the output.

34. A multi-wavelength laser source as defined in claim 32, wherein the pump laser unit is positioned such as to generate the energy signal in a counter-propagation relationship with the output.

35. A multi-wavelength laser source as defined in claim 32, comprising a set of pump laser units in communication with the laser cavity.

36. A multi-wavelength laser source as defined in claim 35, wherein each pump in the set of pumps is associated to a respective wavelength.

37. A multi-wavelength laser source as defined in claim 32, wherein said gain section comprises an amplification section.